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LI. — *A Structure in Adeonella (Laminopora) contorta (Michelin) and some other Bryozoa, together with Remarks on the Adeonidæ.* By ARTHUR WM. WATERS, F.L.S.

[Plates X. & XI.]

SOME specimens of Adeonidæ will be dealt with in papers, almost ready, on collections made by Mr. Cyril Crossland, M.A., F.L.S., at Zanzibar and Cape Verde Islands; but having come upon a most curious structure in several species of the family it seems well to deal provisionally with it, as thereby I may receive help towards clearing up several unexplained points.

Many years ago I saw in *Adeonella polystomella*, Reuss, from Naples, bodies looking like short parasitic worms nearly filling up the zoecium. These slides have been examined at various times and it seemed as if the structure really must be Bryozoan, though satisfactory proof was not seen at the time. However, when I found the same thing in *Adeonella lichenoides*, M.-Edw., from Cape Horn, that seemed to show that it could not be parasitic. While looking upon this as one of the numerous puzzles we have in the Bryozoa, some well-preserved *Adeonella contorta*, Mich., from the Cape Verde Islands showed numbers of these bodies in which much more detail was visible than in the two previous species. Again, in cutting *Adeonella polymorpha*, Busk, from Bass's Straits ('Challenger') for confirmation, only

one of these same bodies was found in the slides prepared. None have been found in sections of *Adeonella platalea*, Busk; in *Adeonellopsis distoma**, Busk; in a new *Adeonellopsis* from Zanzibar shortly to be described; nor in *Adeona foliacea*, var. *fascialis*, Kirichenpauer. This is the limit of material as yet available, some of which was in poor condition, and it is much to be wished that sections should be cut of several *Adeona* and *Adeonellopsis* besides more *Adeonella*. For a time it seemed as if this was a character peculiar to Adeonidæ or perhaps only *Adeonella*, but I came upon a forgotten note concerning a similar structure in *Retepora cellulosa*, L., from Naples, and now find it in *Retepora mediterranea*, Smitt, and *R. elongata*, Smitt, from Franz Josef Land. Although found in one specimen of *R. cellulosa* from Naples, other specimens from there and from other localities are without it in the sections cut. Similarly the first specimens cut of *A. contorta*, M., showed nothing of the kind.

These masses frequently nearly fill up a zoœcium (Pl. X. figs 1, 6, 9) in which the ordinary testes or ovaria are in many cases well developed, and usually a polypide or bud also occurs at the side or over the body, and the zoœcia containing them are frequently close to the zoœcia or rather gonœcia with an embryo. The separate bodies are embedded in what may for convenience be called a matrix, and about twenty seems to be an average number; they are elongate or oval, and round in section (Pl. X. figs. 3, 4, 7, 8). Sometimes a few are more or less separated, and one such body is ciliated all round in a transverse section (Pl. XI. fig. 9). The contents are not always the same, but represent various stages: one stage has large dark cells (in carmine-hæmatoxylin) (Pl. X. figs. 2, 3, 4) of rather varying forms, in one direction often more or less triangular with a large dark nucleus (Pl. X. fig. 2, c); another stage shows these cells with a large nucleolus and a nucleus in the cell (Pl. X. fig. 6) or with nucleus and nucleolus with the cell more irregular, often amœboid in shape, and the body now lined with square cells. Some of these bodies, which remind us of planula, have the cells much more numerous, closer together, and with much smaller nucleus (Pl. XI. fig. 3, b 1). There are other bodies, usually one in each mass (Pl. X. figs. 1 and 2, t.g.), filled with a structure composed of small nuclei or

* This has sometimes been described as *A. coscinopora*, Rss., but as Reuss in his papers described two or three species as *coscinopora* the name had better be dropped, since there must always be uncertainty about it.

cells round hollow spaces, and this stains more than any other part, and this so much resembles parts of testes as seen in some species, that it was examined with this idea, but no confirmation was found. This *Adeonella contorta* material has been in spirit some time and there is contraction from the walls of the zoecia, but this is not the case in sections of *Adeonella polystomella*.

The specimens have not shown the relationship of all the parts, and we want to know more about the earlier stages, though in *Retepora cellulosa*, L., some quite small masses have been seen growing from the lateral wall (Pl. X. fig. 5) and some small masses near the basal wall in *Adeonella contorta*, and further material may supply missing links.

In *A. contorta* I have found some zoecia containing a reticulum upon which there are a number of oval cells*, looking like enlarged nuclei, which stain deeply (Pl. XI. figs. 1, 2). These cells are sometimes much enlarged and irregular in shape and are often seen to be forming groups, which may ultimately be found surrounded by a wall. Some of the bodies are seen in this reticulum, which reminds us of the reticulum in the ovicells of the Cyclostomata and is really a great development of mesenchym cords.

In some cases there are groups of five or six nearly round cells with a small nucleus (Pl. XI. figs. 7, 8), later on we see them enclosed showing the early definite form of the body.

A polypide or bud is frequently found at the side of the mass (Pl. XI. fig. 6, *b*), and sometimes part of a polypide is enclosed, though in many cases this is only apparently so, the mass surrounding part of the polypide alone being bounded by the mesenchym tissue. These groups of bodies are contained in zoecia in various conditions, for they may occur near to zoecia (gonocœcia) with fully developed embryo (Pl. XI. fig. 5) or to zoecia almost filled with testes (Pl. XI. fig. 4), and occur in the same zoecia as the ovaria or spermatozoa, but most frequently in zoecia with buds in various stages; small masses are found in zoecia with polypides in full activity, but as a general rule where the mass is large the polypide has mostly degenerated.

The order of growth seems to be from the stage represented in Pl. XI. figs. 7, 8, through stages shown in several figures, to Pl. XI. fig. 3, *b* 1, then to Pl. XI.

* A small light spot or vacuole is seen in these cells, but cannot always be made out with a $\frac{1}{2}$ immersion; in some of the larger cells there are several spots. No nucleus is visible.

fig. 3, b 2, Pl. X. fig. 2, c: subsequently these large cells disappear, first part of the contents, then the nucleus, and a number of small dark cells float about attached to very fine plasma-threads, which at first looked like tails of spermatozoa, but they are attached to several dark cells and it would appear as if they are plasma-threads with nuclei upon them. These points will have to be worked up with fresh material by younger eyes to whom high power work is less trying.

Beside the interest in the structure and function there is the question of its occurring in several *Adeonella*, in fact in most examined, and it will no doubt be a character of classificatory value.

In *Adeonella* the embryo is very large, often in an enlarged zoëcium, called a gonœcium*; on the other hand, *Retepora* has well-developed ovicells with moderate-sized embryos, and large oral glands, whereas none have as yet been found in the Adeonidæ. Sections have been cut of *Retepora antarctica*, Waters; *R. Couchii*, Hincks; *R. frigida*, W.; *R. hippocrepis*, W.; *R. hirsuta*, Bnsk; *R. lepralioides*, W.; *R. producta*, B., without any of the bodies being found.

In *A. contorta*, &c., these bodies occur in zoëcia in which a large number of the polypides are in full activity, and in which there are many embryos and testes; but I have not found them in zoaria, where almost every zoëcium contains a polypide, so that it may be that they only occur where vitality is diminishing and they may remain when nearly all the polypides have died down. As this probably is a character of the Adeonidæ, a consideration of the family is

* Gonœcium was used by Hincks for a modified zoëcium set aside for reproductive functions, and in speaking of the gonœcium of Adeonidæ it has been considered that the cells for the embryo were all larger. This is by no means the case, as I have seen in a considerable number of species, though in perhaps the majority it may be larger. I may mention as examples *Adeona foliacea*, var. *fascialis*, Kirchenpauer, which has the embryo in a large sac near the distal end, and is about half the length of a zoëcium and occurs in all parts of the zoarium; *Adeonellopsis distoma*, B., in which, after examination of a considerable number, I have found no zoëcia specially larger than the others, but here, again, the embryo is in a large sac at the distal end; *Adeonella contorta*, M., in which the embryo is very large, about the length of a zoëcium; *Adeonella poly-stomella*, Rss. (as redescribed by Manzoni), has all the zoëcia of equal size with the embryo in a thick-walled sac near the distal end of the zoëcium and rather less than half the length of a zoëcium.

Nor must we imagine that an enlarged zoëcium is necessarily only for a large embryo, as there will be a polypide in it, or it may be almost filled with testes; in fact the series of changes in contents may be somewhat similar to those known in the ordinary zoëcia.

As previously explained, I shall continue to use ovicell as a general term, and then we can say the ovicell is a "gonœcium," &c. &c.

advisable, for it is a group of great importance now, and was in past times, so that when fully examined it may receive a position higher than that of a family. Some other points will be dealt with in forthcoming papers, and drawings have been made, but as yet material is not available for complete studies.

There are a number of bilaminate species of Bryozoa, most of which are strongly pigmented, either purple-violet or dark brown: there are long pore-tubes from the inside of the zoecium to the surface and similar pores connecting the zoecia; there are triangular * avicularia on the front of the zoecia, and also frequently vicarious avicularia, both without any transverse bar. These vicarious avicularia often occur on the lateral borders of the zoarium. There are no raised ovicells, and the embryo which is surrounded by a thick-walled sac is usually very large, developing in zoecia which in some species are larger than the others, while in other species there is no difference in size. No oral glands have been found †.

Busk attempted to deal with the group in his 'Challenger' Report, and created the genus *Adeonella*, but it has been seen that his grouping must be largely modified even where retained.

I ‡ showed that in his *Adeonella* there were species in which the pore entered into the zoecial chamber, while in others the pore is above the operculum; also in some the operculum is nearly straight on the proximal border, in others there is a broad curve showing that there is a wide sinus on the aperture. I am now able to add that the species in which the operculum is nearly straight or slightly curved also have in nearly all cases a pore or perforated area entering into the zoecial chamber, and this group has been called *Adeonellopsis* § by MacGillivray, and we may expect it to be

* I have a specimen from S. Africa which I consider is the *Adeona intermedia*, Kirchenpauer, which has, besides ordinary triangular avicularia, large chambers at the side of the fenestrae directed laterally, and closed by a chitinous cover with an absolutely straight lower edge and semicircular distal end. This is probably an avicularium similar to that of *Schizoporella linearis*. Busk had the same species from Australia and gave it the manuscript name *Adeonella inaequalis*. 99. 7. 1. 2756, B. Mus.

† I have found no embryo in specimens of *Beania magellanica*, B., from Naples, but sections of a specimen from Chatham Island contain a very large embryo with a thick-walled sac nearly filling the zoecium.

‡ "Chil. Bry. from Aldinga and the River Murray Cliffs, S. Australia," Quart. Journ. Geol. Soc. vol. xli. p. 282 (1885); "Suppl. Report on the Polyzoa," Rep. Voyage of the 'Challenger,' vol. xxxi. pt. lxxix. pp. 2 & 33 (1889).

§ Levisen in his "Studies on Bryozoa" called this *Lobopora*, but in his large work dropped the genus, as it is superfluous.

generally adopted, even if some limitations have to be made. The group without a zoëcial pore presents more difficulties and my suggestion was that it alone should be called *Adeonella*, and it has even been doubted whether it should remain in the same family.

Mr. Hincks criticised my placing *A. polystomella*, Rss., with the group, but his criticism seems to be based upon a misapprehension: one reason he gives is that it has no avicularia, whereas, although avicularia do not occur to all zoëcia, they are fairly abundant, with either one or two narrow avicularia, without a cross-bar, to each zoëcium.

Gregory * reviews very fairly the opinions expressed by various workers and naturally lays great stress on the ovicells being gonœcia, and my restricted *Adeonella* falls into his Adeonellidæ; but he unfortunately makes a new genus *Schismoporella* for Reuss's *Lepralia schizogaster*, though Reuss's last † figure shows that what Gregory calls a "trypa" is really a narrow avicularium, so that the species is an ordinary *Schizoporella*.

Levinsen ‡ in his large work accepts my restricted *Adeonella*; his *Adeona* has one or two simple "ascopores" §, and includes the reticulate *Adeona*, namely what has been understood as *Adeona*, together with "*Adeona violacea*," Johnst., as a synonym of *Adeonella insidiosa*, Jull.; but this point I am not prepared to accept at present, for Hincks's *A. violacea* and his var. $\alpha = insidiosa$, Jullien, seem distinct species, even if they fall into the same genus. Levinsen puts *Bracebridgia*, MacG., under Adeonidæ. *Adeonellopsis*, according to Levinsen, has one or several ascopores, whereas I should say it has the proximal edge of the operculum straight or nearly so, and has usually a perforate area (or sometimes only a pore) in one or both forms of zoëcia, with the pores usually stellate.

We have on the outskirts of both the *Adeonella* and *Adeonellopsis* difficulties, for in *Adeonella* there is *A. bimunita* ||, Hincks, which is deeply pigmented, has the long pore-tubes, long triangular avicularia without a bar, also vicarious avicularia of the Adeonidæ type, and gonœcia rather larger

* "Brit. Palæogene Bryozoa," Trans. Zool. Soc. Lond. vol. xiii. pt. vi. p. 241 (1893).

† "Fossilen Bryozoen des Oest.-Ung. Miocäns." Denk. math.-naturwiss. d. k. Akad. der Wissensch. vol. xxxiii. p. 161, pl. iii. fig. 10 (1874).

‡ 'Morphological and Systematic Studies on the Cheilostomatous Bryozoa,' p. 282 (1909).

§ Gregory has called a pore perforating the front wall a trypa, and Jullien and Calvet have called the pore of *Adeona* &c. the spiramen, so that ascopore scarcely seems required.

|| This is the *Adeonella crassa*, Busk, MSS.

than the ordinary zoëcia, but the operculum fits into a distinct sinus; following on this is *Adeonella (Laminopora) contorta*, Mich., a bilaminate erect species branching in various directions, with short contorted bilaminate growths springing at right angles from the main branches. It has similar long narrow avicularia without any bar, long pore-tubes, but no suboral pores, and a very long operculum. This has most of the characters of *Schizoporella*; but there are large embryos, in a thick sac, within gonœcia not externally larger than other zoëcia, though in sections they appear to be larger. The bodies now described in this paper are fairly abundant and we have seen that they occur in several other *Adeonellæ*.

In *Adeonellopsis* there are three species with the same sized flat branching zoarium, the oral aperture the same size and shape, and a small avicularium on one side just below the aperture; but the first, *A. distoma*, Busk, has an area with stellate perforations, the second, *A. subsulcata*, Smitt, has one round pore, while *A. imperforata*, Busk, has no pore. This is not what we should have expected and creates a difficulty in our classification, indicating that we must be careful not to attach too much generic value to the structure of the front wall.

The embryos of the Adeonidæ have not yet been described, but in my forthcoming papers figures and descriptions of some will be given. The species available have been *Adeona foliacea*, var. *fascialis*, Kirchenpauer; *Adeonella platalea*, Busk; *A. lichenoides*, Lamk.; *A. polymorpha*, Busk; *A. polystomella*, Hincks; *A. contorta*, Mich.; *Adeonellopsis distoma*, Busk; and a new *Adeonellopsis* from Zanzibar: and all except *Adeona foliacea*, var., *Adeonellopsis distoma*, and *Adeonella polystomella*, Rss., have a large embryo in a thick-walled sac, frequently filling up nearly the whole zoëcium. The embryo of *Adeonella polystomella* is in a thick-walled sac, but it is smaller than the others. In *Lepralia cucullata**, Busk, which has an internal embryo, the sac is thin-walled like the tentacular sheath; and in *Lepralia*† and *Schizoporella* there are many cases in which

* Waters, "Mar. Biol. of Sudanese Red Sea," Bryozoa, Journ. Linn. Soc., Zool. vol. xxxi. p. 150, pl. xv. fig. 4 (1909).

† Among others the following have the ovicelligerous zoëcia larger than other zoëcia:—

<i>Lepralia depressa</i> , Busk.		<i>Monoporella waipukerensis</i> , Waters.
<i>Lepralia bistata</i> , Waters, fossil from New Zealand.		<i>Hipporina</i> , Neviani.
<i>Lepralia cincta</i> , Hincks, but with an ovicell.		<i>Hippothoa</i> .
<i>Schizoporella subimmersa</i> , MacG.		<i>Cateschara</i> .
		Many Catenicellidæ.

the ovicelligerous zoœcia have a different shaped aperture, larger than that of the ordinary zoœcia, but more work is required on the internal anatomy of these. The limits of the group Adeonidæ will have to be based partly upon the form of the embryo.

The bodies described in this paper occur in *Adeonella lichenoides*, *A. polystomella*, B., *A. polymorpha*, B., *A. contorta*, Mich.; but none were found in specimens of *A. platatea*, B., *Adeonellopsis distoma*, B., in the new *Adeonellopsis* referred to, or in *Adeona foliacea*, var. *fascialis*, Kirch.: that is, we have it in several *Adeonella*, but not as yet in *Adeonellopsis*.

Now with regard to the characters of the Adeonidæ, the pigment is common to *Holoporella*, and we must emphasize the fact that it is not the pigmentation of an external membrane, but of the contents of the pore-tubes and pigment-cells over the surface; the long tubular pores occur in *Myriozeum*, *Haswellia*, &c. The long narrow avicularium without any bar is a character of considerable importance; but we also find avicularia without any bar in some *Membraniporæ*, &c., and the projecting process to which Busk refers is well marked throughout the group, but as it occurs in *Cribilina*, *Micro-porella*, a large number of *Membraniporæ*, and other genera, this character may be dismissed as of very secondary importance. And with regard to the oclnsor muscle being single, as stated by Busk, this is the rule with triangular mandibles, whereas the semicircular ones have two bands, so this is a useless character; but although none of the characters given by Busk can stand as he stated them, yet apparently he was right in appreciating that there was the group Adeonidæ.

All the ovaria of Adeonidæ seen, excepting *Adeona foliacea*, var. *fascialis*, consist of two ovarian cells or occasionally three, and with the exception mentioned, no large ovarian cell has been met with. The ovaria originate near the distal end, although close to the proximal end of large embryos one or even three small ovarian cells sometimes occur. In *A. foliacea*, var. *fascialis*, K., the ovaria at first consist of two rather small ovarian cells, but later on one may attain a moderate size.

In the Bryozoa there are sometimes ovaria with only two, or perhaps three, small ovarian cells, neither of which grows to any large size, but passes into the ovicell quite small. In opposition to this there are ovaria with many ovarian cells, one or more of which often attain to a considerable size.

The first I would call the bicellular and the second the multicellular ovaria, though, as the multicellular forms may pass through a stage somewhat like the bicellular, it must be presumed that sufficient material is available before stating to which group ovaria belong. In *Bugula* the ovarium is bicellular and is formed at the proximal end near to the cæcum, passing into the ovicell when quite small. In *Scrupocellaria* the ovarium is multicellular and near the distal end, with some of the ovarian cells very large. Some forms, recently removed from *Bugula* by Levinsen, have the multicellular form, showing by this that they are not so closely allied to *Bugula* as was previously supposed. There are other genera in which the study of the ovaria is going to give us some classificatory assistance.

The Adeonidæ in its fullest sense is a most important group in the Tertiary and Cretaceous periods, as I have seen in the examination of my Cretaceous collections, and a study of Hagenow's and other plates suggests that a large number belong to this group, though in but few is there any difference in the size of the gonœcia and other zoœcia.

There are gonœcia in the fossil *Poricella**, Canu; in *Smittistoma*, Canu, *Schizostoma*, Canu, *Calvetina*, Canu; also in the family Meniscoporidae, including *Poristoma*, Canu, *Meniscopora*, Gregory: but although an external difference in size of the ordinary and gonœcial zoœcia has been seen in some species of Adeonellidæ and its allies, both recent and fossil, it must be repeated that in very many no difference can be found, and this is the case in many Chalk fossils which will probably be found to belong to the group †.

It is a noticeable fact that as we go back in the geological record the number of genera with external ovicells becomes much less numerous. In the Tertiaries the Adeonellidæ and Meniscoporidae with gonœcia were largely represented, as were also the Onychozellidæ, which have an internal sac for the development of the embryo, also their ally *Cellaria* has no raised ovicell. In the Cretaceous the number with external ovicells is still more reduced. The older workers were not as keenly on the lookout for ovicells as a useful classificatory character as we are, but that is by no means the chief reason why so few have been described fossil.

* "Bryozoaires des terrains tert. des env. de Paris," Ann. de Paléont. vol. ii. p. 46 (1907); and Étude des Bry. Tert. . . . de la Tunisie, p. 28 (1904).

† The common Tertiary "*Eschara*" *monilifera* has gonœcia.

Adeonella (Laminopora) contorta (Michelin).

Laminopora contorta, Michelin, Magasin de Zoologie, 1842, pl. iii.

I saw several specimens marked *Laminopora contorta* in the Muséum d'Hist. Nat. in Paris and found that it had been described by Michelin. I have since seen it in several museums, from the North Atlantic, mostly from the Cape Verde Islands. However, there are two specimens in the British Museum marked the Red Sea. One of these is known to have been bought at a sale, or in some such way, but the other is marked "Mrs. Robinson bequest," so that we must conclude it occurs in the Red Sea, but it did not come before me when I was at work upon the Red Sea fauna. There is also in the British Museum a specimen from Cape St. Vincent, Spain, 54. 11. 15. 334-336, and some specimens from "John Adams Bank," which, according to Harmer*, is near the Abrolhos Island, Brazil. There is another Abrolhos Island off W. Australia. These specimens had the manuscript names *Eschara* and *Adeonella dolichostoma*, Busk.

Calvet records it from the Cape Verde Islands † and in the same work describes *Gemellipora arbuscula*, Calvet, from the same locality ‡. This has not the numerous short branches at right angles to the main branch, but it is like *A. contorta* and may be a colony before subsequent lateral growth had formed. Both have large lateral avicularia along the border of the zoarium, with broad triangular mandibles directed distally.

The specimens from which I cut sections were collected by Crossland from Boa Vista, Cape Verde Islands, and will be described with his collection from Cape Verde Islands. As the opercula are very thick and there is some gritty matter enclosed during growth it has been difficult to get good serial sections.

In a branch it often happens that the opposite zoecia are of the same kind—that is, zoecia containing an embryo are often opposite, as are zoecia nearly filled with testes, and also zoecia with the bodies described are often opposite. Should it be found advisable to separate *A. contorta* from *Adeonella* then *Laminopora* may stand.

In *A. contorta* and some fossil Adeonidæ there is a tubule over the operculum in some of the older zoecia; but although

* "Revision of the Genus *Steganoporella*," Quart. Journ. Micr. Sci. vol. 43, n. s. p. 254 (1900).

† Expéd. Sc. du 'Travailleur' et du 'Talisman,' p. 420 (1907).

‡ *Loc. cit.* p. 426, pl. xxvii. figs. 16-19.

this reminds us of the tubule on the closure of many Cyclostomata it is very different, as it occurs over the operculum, and in sections where there has been a second layer of zoëcia this is seen like an inverted funnel attached to the tissues of the zoëcium below the operculum.

As Michelin's description is in a periodical not readily obtained it is now repeated: "Laminopora fixa, ramosa, subcompressa, ramulis lamellosis, brevibus divaricatis, contortis, raro coalitis; extremitatibus undulatis, porosissimis; poris utraque superficie, terminalibus, subrotundis, sæpe obstructis; fuscante."

EXPLANATION OF THE PLATES.

PLATE X.

- Fig. 1.* *Adeonella contorta*, Mich. $\times 150$. Section of a zoëcium nearly filled with the described bodies in a plasma mass, surrounded by mesenchym tissue. The left-hand body (*t.g.*) near to the opercular aperture stains much more than any others. The various bodies vary considerably in structure, and this mass may be taken as quite characteristic, a large number of practically similar ones having been seen.
- Fig. 2.* Ditto. $\times 720$. Part of the above more magnified, showing the left-hand tube-like body partly filled with a deeply staining growth (*t.g.*).
- Figs. 3, 4.* Ditto. $\times 720$. Transverse sections of bodies.
- Fig. 5.* *Retepora cellulosa*, L. $\times 250$. A small mass growing on the lateral wall of the zoëcium.
- Fig. 6.* *Adeonella contorta*, M. $\times 250$. Section of a zoëcium showing a mass with several bodies and a part of a bud (*b*) by the side, but not enclosed in the mass; pore-tubes (*p.*) full of dark cells; outer membrane (*o.m.*) of the zoarium; operculum (*op.*); walls of the zoëcium (*w.z.*). This specimen is somewhat difficult to understand, as it has the appearance of being reversed.
- Fig. 7.* Ditto. $\times 720$. Transverse section of body.
- Fig. 8.* Ditto. $\times 720$. Longitudinal section of body.
- Fig. 9.* Ditto. $\times 250$. Transverse section showing mass with several bodies, and here the histolysing remains of the tentacles of a polypide are enclosed in the mass.
- Fig. 10.* Ditto. $\times 25$. Transverse section showing several masses in zoëcia, and other zoëcia in which the tentacles, stomach, &c. are seen in vigour. Zoëcia *a, c, d, f, m* show sections of the polypide; *b, g, j, k, l* show masses of the bodies described; *h, i* show the opercular muscles; *e* is empty.

PLATE XI.

- Fig. 1.* *Adeonella contorta*, Mich. $\times 320$. Zoëcium containing mass with dark cells of varying sizes on a reticulum formed of anastomosing plasma. Two of the bodies described are seen

in this mass and outside it part of a polypide. The tentacles (*t.*) are cut through diagonally and the stomach (*st.*) has cilia and evidently the polypide was in vigour.

- Fig.* 2. Ditto. $\times 720$. Part of the same mass more magnified.
- Fig.* 3. Ditto. $\times 250$. Mass showing one body with numerous cells close together and with a small nucleus (*b 1*) and another (*b 2*) in which they are much larger, further apart, and with a much larger nucleus. This and other parts figured were examined with a $\frac{1}{2}$ immersion and reduced.
- Fig.* 4. Ditto. $\times 25$. Section of the end of a branch in which there are two zoecia (*c, d*) almost filled up with testes, and zoecia (*a, e, g*) with several of the bodies described.
- Fig.* 5. Ditto. $\times 25$. Section of the end of a branch in which there is one embryo (*c*) and several of the bodies (*a, e, h, i*).
- Fig.* 6. Ditto. $\times 85$. Mass with the early stage represented by two groups of cells near the middle, and also other small bodies.
- Figs.* 7, 8. Ditto. $\times 720$. The early groups of cells more magnified.
- Fig.* 9. Ditto. $\times 720$. Body with cilia.
- Fig.* 10. Ditto. $\times 85$. Mass in zoecium with some of the bodies separated as an independent group. Muscles of the zoecium shown at the side.
- Fig.* 11. Ditto. $\times 250$. Testis nearly filling up a zoecium (see *fig.* 4).

LII.—*Descriptions of some apparently new Butterflies from Borneo and one from Africa.* By HAMILTON H. DRUCE, F.L.S. &c.

Lycænidæ.

Lycænopsis shelfordii, de Nicéy.

Lycænopsis shelfordii, de Nicéy. J. B. N. H. S. xiv. p. 245, pl. FF, *fig.* 7, ♂ (1902).

♀. Upperside: fore wing white, with the costa, apex, and termen broadly smoky brown, the basal and discal area suffused with pale opalescent pearly blue. A small brown spot closing the cell. Hind wing pale smoky brown, with the discal area whitish and the base slightly suffused with opalescent blue; an indistinct submarginal row of lunules. Underside as male, but ground-colour paler and spots rather larger.

Hab. Borneo. Batu Lawi Expedition (*J. C. Moulton*).

The female described above, together with a male captured on the same expedition whose genitalia Dr. Chapman has kindly examined and confirmed as *L. shelfordii*, will be placed in the British Museum. The male was taken on May 20th, the female on May 21st.